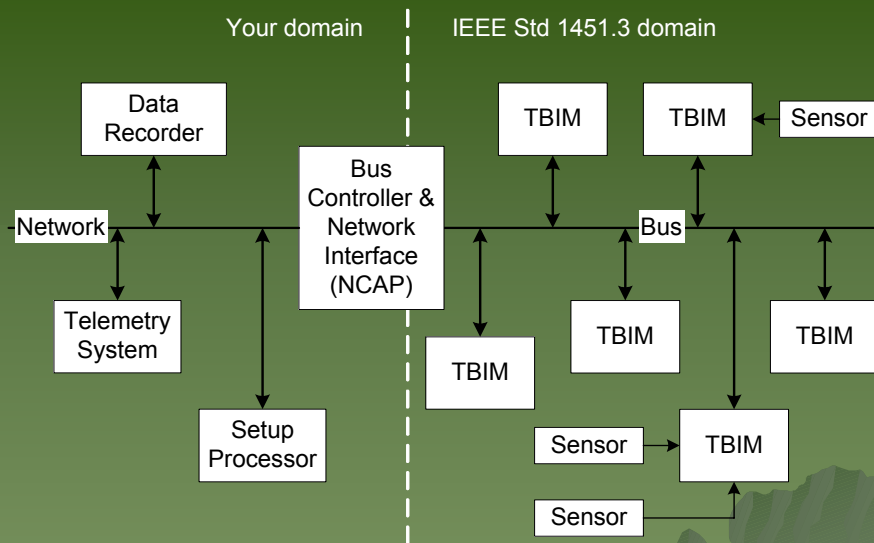


IEEE Std.1451.3-2003

Lee Eccles
Technical Editor
IEEE 1451.3 Working Group
lee.h.eccles@boeing.com

System Concept



Transducer Types

- ◆ IEEE 1451.3 Transducer Types
 - Sensor
 - Event Sensor
 - Actuator
- ◆ Embedded Transducers
 - Measure or control some aspect of another transducer channel
 - Have no effect outside the TBIM
- ◆ TransducerChannel Proxies
 - Combine the Inputs or Outputs for several Transducers into one device for data transmission efficiency
 - Do not have TEDS

Attributes and Operating Modes

- ◆ Operating modes are defined with attributes
- ◆ Sampling Modes
 - Triggered
 - Free Running
- ◆ Buffered operation
- ◆ End-of-data-set operation
 - Hold
 - Recirculate

Attributes and Operating Modes

- ◆ Streaming mode
- ◆ Event Sensor Edge-to-report
 - Rising Edge
 - Falling Edge
 - Both
- ◆ Actuator-halt mode
 - Halt immediate
 - Halt at the end of the data set
 - Ramp to a predefined state

Triggering

- ◆ Trigger Message
- ◆ An event within a TBIM
 - An event sensor detects the event
 - Transducers in other TBIMs are not triggered
- ◆ Beginning of an isochronous interval signal.
 - Usually associated with streaming operation

Synchronous Operation

- ◆ Two methods of obtaining synchronous operation
 - Group or Global Triggers
 - Use of the synchronization Signal
- ◆ Synchronization Signal
 - Two Megahertz signal
 - Modulated to aid isochronous data transmission & synchronous operation

Time Tagging of Data

- ◆ System is designed to allow the data to be time tagged.
- ◆ In most cases it can be time tagged in the NCAP using information from the TEDS.
- ◆ In other cases it can be time tagged in the TBIM
- ◆ A combination of the two methods can be used.

Command Classes

- ◆ Initialization
 - 16 commands
- ◆ Operational
 - 13 commands
- ◆ Set operating mode
 - Six attributes
- ◆ Read operating mode
- ◆ Run diagnostic
 - Run all
 - Manufacturer defined
- ◆ Query TEDS
 - Function selects the TEDS
- ◆ Read TEDS
- ◆ Write TEDS
- ◆ Update TEDS

Manufacturer Defined Commands

- ◆ Manufacturers may define additional commands in any of these classes.
- ◆ Manufacturers may define additional classes.
- ◆ Manufacturer defined commands require a Command TEDS.

Transducer Electronic Data Sheets (TEDS)

- ◆ Meta-TEDS
 - Gives the characteristics of the TBIM.
- ◆ Transducer Channel TEDS
 - Gives the characteristics of a single Transducer Channel.
- ◆ Calibration TEDS
 - Gives the constants necessary to convert data to/from Engineering Units.
 - Can also perform compensation

Transducer Electronic Data Sheets (TEDS)

- ◆ Frequency Response TEDS
 - Gives the frequency response data for a single Transducer Channel as a table.
- ◆ Transfer Function TEDS
 - Gives the frequency response data for a single Transducer Channel with an algorithm.
 - User can combine with the desired response to compensate the data.

Transducer Electronic Data Sheets (TEDS)

- ◆ Text based TEDS
 - Allows manufacturer to provide textual information with the device.
 - Written in XML
- ◆ End user application specific TEDS
 - Written by the user with user data.
- ◆ Commissioning TEDS
 - Provided for the user to name the Transducer Channel

Transducer Electronic Data Sheets (TEDS)

- ◆ Commands TEDS
 - A text based TEDS to be used by the manufacturer to define new commands.
- ◆ PHY TEDS
 - Defines parameters unique to the Physical Communications media.
- ◆ Manufacturer Defined TEDS
 - Allows the user to define additional features.

Addressing

- ◆ An address has been defined that is independent of the address used for the physical media or MAC.
- ◆ Two eight bit fields in the address
 - Module address (TBIM Alias) – assigned by the system
 - Transducer Channel number – assigned by the manufacturer and not changeable in the field.

Addressing

Address class	TBIM Alias	Transducer Channel number
Global	Zero	Zero
Address Group	Zero	Non-zero
TBIM	Non-zero	Zero
Transducer Channel	Non-zero	Non-zero
NCAP address	255	Zero

Communications Protocols

- ◆ Command Services
- ◆ Reply Protocol
- ◆ IEEE 1451.3 Datagram Protocol
 - Similar to UDP
- ◆ Streaming Data Protocol
- ◆ Trigger Protocol

Communications Services

- ◆ Streaming Mode Management Services
- ◆ Streaming Mode Protocol Services
- ◆ Discovery Services
- ◆ Transmitter control services
- ◆ Datagram Protocol Services
- ◆ Trigger protocol services
- ◆ Delay measurement services

MAC and Physical Layer

- ◆ Home Phoneline Networking Alliance MAC and Physical layer (HPNA)
 - Occupies spectrum from 4.75 to 9.25 MHz
- ◆ Synchronization added on the same pair of wires
 - 2 MHz synchronization signal
- ◆ DC Power
 - Power recommended but not specified by the standard.

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MAC and Physical Layer

- ◆ Home Phoneline Networking Alliance MAC and Physical layer (HPNA)
 - Chosen because it was expected to be a “commodity item”
 - IEEE 802.11 has taken over that market
 - Chips are not as readily available as expected
 - Support is even less available
 - We are looking at FPGA solutions

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